

Washington State Department of Transportation

Prioritization Process for State Highway Projects

**Submitted to: The Legislative Transportation Committees
of the Senate and the House of Representatives**

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*The 2002 Legislature directed the Department of Transportation in Engrossed Substitute House Bill 2304 to report the **results of its priority programming under RCW 47.05.051** to the transportation committees of the senate and house of representatives by December 1, 2003. RCW 47.05.051 encompasses the criteria the department must follow to identify highway needs in Washington's Transportation Plan and the priority selection system to rank projects that address the needs.*

Introduction

This report describes the current priority programming processes used for state highway projects. There is not one process employed by the Department, but several. These various processes align with the budget structure for the highway construction programs. This report is exclusively about the highway preservation and improvement programs and does not include information relating to ferries or other modes.

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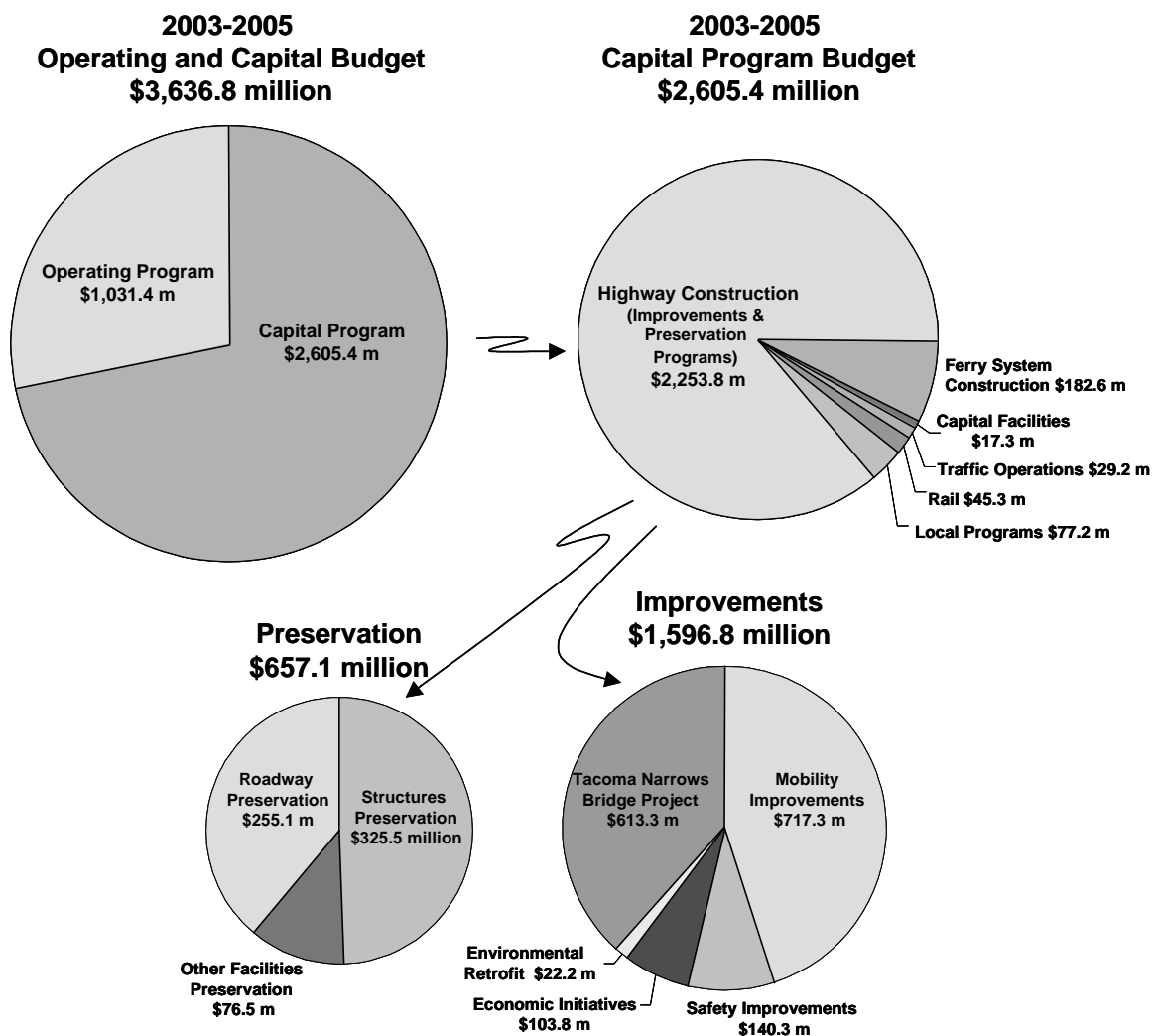
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Highway Construction Funding Overview

Like the spending plan for every large facility activity in the public sector, WSDOT's budget has both an operating and capital component. Of the \$3.6 billion capital and operating budget, the capital component makes up \$2.6 billion (73%). The highway construction program is divided into two main categories; preservation and improvements. \$657 million has been appropriated for the preservation program and \$1.6 billion for the improvement program. It should be noted for the improvement program, the Tacoma Narrows Bridge project was appropriated \$613 million, leaving the remaining improvement program at just under \$1.0 billion.



State Highway Project Prioritization Arrays

Highway system needs are categorized and projects addressing those needs are prioritized within the highway preservation and improvements programs in accordance with state law. (RCW 47.05.051). The final determination of the size and direction of the program and project is established by the legislature.

The 2003 prioritization processes generated the following arrays listed below. Each of these arrays is detailed in an appendix to this report.

The Highway Preservation Program

Pavement Management

- Chip Seal (Due)
- Chip Seal (Past Due)
- ACP (Due)
- ACP (Past Due)
- Concrete

Structures Preservation

Preservation of Structures

- Major Repair
- Steel Bridge Painting
- Bridge Deck Rehabilitation
- Bridge Rehabilitation/Replacement
- Miscellaneous Structures
- Moveable Bridge Repair

Prevention of Catastrophic Bridge Failure

- Seismic
- Scour

Other Facilities Preservation

- Unstable Slopes
- Weigh Stations
- Rest Area Rehabilitation
- Major Drainage Rehabilitation
- Major Electrical Rehabilitation

The Highway Improvement Program

Mobility Improvements

- Urban/Rural Mobility
- Puget Sound Core HOV Lanes
- Urban Bicycle Connectivity

Safety Improvements

Collision Reduction

- High Accident Locations (HALs)
- High Accident Corridors (HACs)
- Pedestrian Accident Locations (PALs)

Collision Prevention

- Interstate Safety
- Risk Reduction
- At Grade Intersection
- Signal & Channelization
- Pedestrian Risk
- Special Safety Initiatives

Economic Initiatives

- All Weather Highways
- Four-Lane Trunk System
- Restricted Bridges
- New Rest Areas
- Rural Bicycle Touring Routes

Environmental Retrofit

- Fish Barrier Removal
- Noise Reduction
- Stormwater Retrofit

About the Process

What is Priority Programming?

Priority programming is the use of a collection of information on benefits and costs of transportation investment options to help decision-makers in allocating scarce funding to particular projects. State Law *Chapter RCW 47.05 Priority Programming for Highway Development* directs WSDOT to perform this function and incorporates the following general steps:

Identify transportation needs based on factual data so the magnitude of the need and the effect it has on the performance of the transportation system is clear (RCW 47.05.051). This is done as part of the highway system plan element of Washington's Transportation Plan.

Group similar needs into categories so proposed projects which address the needs can be compared against each other.

Determine the performance that each project can provide and at what price. Look at alternatives to find the most cost effective action (RCW 47.05.030).

Place the most cost effective alternative in rank order of the change in performance and cost (RCW 47.05.051).

Develop a method for comparing categories of like projects with others to determine how the performance measure for that group will change if funding is moved between categories (RCW 47.05.035).

Methods used by WSDOT to develop the *State Highway Project Prioritization Arrays* vary significantly from category to category. Some methods used are more refined and systematic than others and some have benefited from greater attention, in some instances, years of data collection and analysis. All of the Department's prioritization methods can benefit from an increased use of information management tools as well as continuous review and improvement to gain the benefit of experience.

The Highway Preservation Program

What does the state law require for prioritizing preservation projects?

The Department must use a process to select projects to preserve the existing state highway system and to restore existing safety features, which gives considerations to lowest life cycle costing (RCW 47.05.051 (1)).

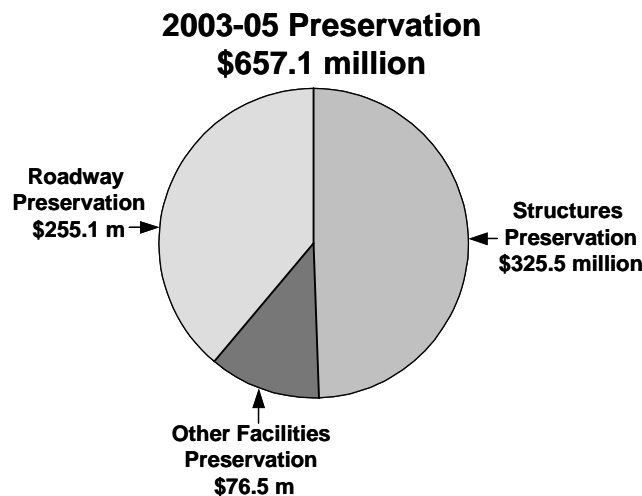
In developing the scope of work for these preservation projects, the Department must use the most cost-effective pavement surfaces which take into consideration the following: (RCW 47.05.030 (1))

- Life cycle cost analysis
- Sub-grade soil conditions
- Environmental and weather conditions
- Traffic volume
- Materials available
- Construction factors

For the 2003-05 budget, the legislature placed additional emphasis on preservation of asphalt pavements using lowest life cycle cost principles by inserting the following:

“The department of transportation shall continue to implement the lowest life cycle cost planning approach to pavement management throughout the state to encourage the most effective and efficient use of pavement preservation funds. Emphasis should be placed on increasing the number of roads addressed on time and reducing the number of roads past due.”

State highways include approximately 19,000 lane miles of pavement, over 3,000 bridges and numerous other fixed assets such as retaining walls, sign bridges, rest areas, weigh stations, culverts, traffic signals, and light poles that wear out and need to be rehabilitated or replaced. WSDOT budgets for the preservation of these fixed assets through the following budget subprogram structure:



Pavement Management (Roadway Preservation)

Roadway preservation includes the repaving of roadway surfaces at regular intervals. Arrays for repaving of roadway surfaces are developed for four categories:

- Chip Seal, Miles Due
- Chip Seal, Miles Past Due
- Asphalt Concrete Pavement, Miles Due
- Asphalt concrete Pavement, Mile Past Due

Prioritization Arrays for the categories above can be found behind the 'Pavement Management' tab in the appendix.

How does the Department evaluate pavement condition?

The Washington State Pavement Management System (WSPMS) plays a pivotal role in identifying and prioritizing roadway preservation projects. As part of this process, pavement surface condition data is collected annually, then rated and analyzed for the entire state highway system. The three types of condition measures used for evaluation are:

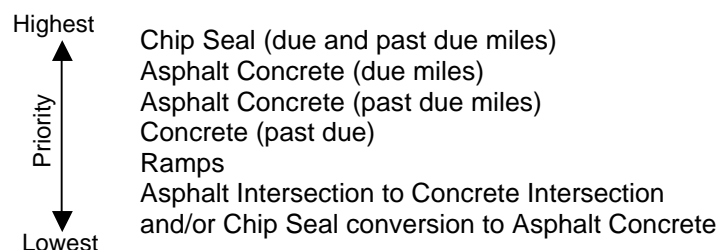
- Pavement Structural Condition (cracking, patching, etc.)
- Rutting (Ruts greater than 1/3 inch deep require rehabilitation)
- Roughness (characterized by international roughness index (IRI))

The annual pavement condition data is then joined with the historical condition data in the Washing State Pavement Management System. WSPMS uses this historical pavement condition data along with roadway geometric, functional, construction and programmed projects data to develop the unique performance characteristics of each roadway segment, predict the best time to rehabilitate each segment using lowest life cycle cost concepts and then helps prioritize the rehabilitation projects according to the functional class of the highway (most traveled routes versus less traveled routes).

How does the Department prioritize pavement projects?

Each segment of state highway is assigned a year where the cost is projected to be the “lowest cost” for resurfacing. This is known as the “due” year. If the highway segment is not paved during that year it becomes “past due”. The Department uses the WSPMS information to determine if the roadway pavement sections have reached the “due” year where they need to be resurfaced to prevent additional deterioration resulting in either increased maintenance costs or added reconstruction cost. This is not a perfect science. Some roadway segments might actually be in the “past due” category for a few years without coming into significantly higher rehabilitation costs, but other segments may.

If there are not enough funds to pave all the required lane miles according to the lowest life cycle cost averages, the Department prioritization policy is to rank the needs in the following order to minimize additional deterioration and potential future cost increases:



Chip Seals are prioritized first because of their low cost per mile to pave when “due”; approximately \$15,000, compared to a rehabilitation project when “past due”, which may exceed \$100,000 per lane mile. In other words, the additive cost of deferring chip seal “past due” pavement can be very high.

A total of 317 “past due” asphalt pavement lane miles will be addressed in 2003-2005. This will decrease “past due” lane miles from 654 to 568 by the end of 2005.

Note: The 2003-2005 budget proviso asking WSDOT to “increase the number of roads addressed on time and reduce[ing] the number of roads past due” speaks to an issue WSDOT discussed with legislators during session. This application of strict programming regiment based on lowest life cycle cost had been somewhat deviated by persistence of a long-standing administrative tradition of lump-sum allocation of pavement preservation funds to the region. This tended to introduce distortions from time to time in the statewide attainment of lowest life cycle cost prioritization strictly using the pavement condition assessment and “past due” prioritization. This distorting tendency has now been corrected by making ‘regional’ pavement allocations based on pavement conditions.

Structures Preservation

This program area results in several priority arrays. They are categorized into two main areas; preservation of bridges and other structures and the prevention of catastrophic bridge failure

How does the Department identify bridge needs?

WSDOT identifies needs through an ongoing inspection program that follows federal regulations. Washington State bridges undergo rigorous inspections every two years. This includes annual underwater diving inspections of floating bridges. One-third of the underwater cable systems are inspected annually. Bridges with moveable spans receive a special in-depth inspection once every five years.

Preservation of Structures

This category of projects extends the service life of bridges in the most cost effective way. The goal of these projects is to defer the ultimate need to replace bridges for as long is economically feasible. Projects address the following areas:

- Major Repair
- Steel Bridge Painting
- Bridge Deck Rehabilitation
- Bridge Rehabilitation / Replacement
- Miscellaneous Structures
- Moveable Bridge Repairs

Prioritization arrays for each of these project types can be found in the appendix behind the ‘Structures Preservation’ tab.

Major Repair

Major bridge repairs are prioritized based on the engineering judgment of WSDOT bridge engineers who take into consideration the safety of the motoring public, increased maintenance cost if nothing is done, and the reduced life expectancy of the structure and the additional cost required to

replace the structure early. WSDOT engineers creating the priority arrays do not rely on mathematical formulas or algorithms.

The major bridge repair portion of the Structure Preservation Program includes corrective work that cannot be accomplished within the Department's maintenance program. This work addresses specific bridge elements in need of repair such as the replacement of piers and anchor cables, the repair or replacement of expansion joints, and the repair of corrosion-induced deterioration.

The Department does not generally undertake to upgrade all bridge deficiencies to current standards as part of this work. A major bridge repair is generally in excess of \$50,000 and accomplished through a state contract.

Steel Bridge Painting

Protective paint coatings on steel bridge elements are essential to prevent corrosion and loss of structural capacity. Steel bridges typically need to be re-painted every 15 to 20 years based on the condition of the existing paint. WSDOT schedules a bridge to be over-coated with new paint when two to five percent of the existing paint has failed.

The Department uses a cost-effective three-part paint system to overcoat the existing paint on its steel bridges instead of complete removal of the existing paint before adding a new paint system. Each biennium the Department prioritizes and selects bridge painting projects up to the available funding level based on the age of the paint and the percentage of the surface area of failed paint. Similar to other projects, coordination with other work can sometimes result in selecting projects out of strict order from the priority array.

Bridge Deck Rehabilitation

For years, concrete bridge deck deterioration has been the largest single bridge-related problem in the country. WSDOT has been working since the early 1980's on a systematic program aimed at preventing future concrete deterioration through the use of epoxy-coated rebar in new bridges and by the repair of deteriorated and traffic related damaged rebar with durable protective overlays on existing bridge decks.

Bridge deck projects are prioritized based on the amount of exposed (square feet) reinforcing steel and the surface area of delaminated concrete.

Bridge Rehabilitation / Replacement

Rehabilitation or replacement of bridges is considered when the cost of maintaining the structure becomes too high or when there is a potential for load limits on the bridge that will result in increased travel costs for detoured vehicles.

Rehabilitation or rebuilding a bridge brings the structure up to current design and environmental standards and include pedestrian and bicycle facilities if warranted. In addition, roadway alignment onto and off of the

bridge is brought up to standards to ensure adequate sight distance for passing or stopping.

Prioritization arrays for bridge rehabilitation or replacement are based on the structural adequacy of each component of the bridge, the average daily traffic volume, and the detour length.

Miscellaneous Structures

WSDOT's inventory of miscellaneous structures includes sign support structures, high mast luminaries, standard and special design retaining walls, bridges under twenty feet long, and small-movement expansion joints.

Prioritization of these projects is dependent on coordination with other projects, engineering assessment of the structural adequacy, and safety to the public.

Moveable Bridge Repair

Moveable bridge repair includes corrective work on moveable bridge electrical and mechanical systems that cannot be accomplished within the Department's maintenance program. There are currently six bridges with moveable components in the state.

A moveable bridge repair is generally in excess of \$50,000 and accomplished through a state contract. A prioritized list of moveable bridge repair needs is developed each biennium based on the safety to the motoring public, increased maintenance cost if nothing is done, and lost time for users if the bridge component fails during an opening or closing resulting in users being unable to cross. There is no mathematical formula used by WSDOT engineers to create the priority arrays for moveable bridge repairs.

Prevention of Catastrophic Bridge Failure

This category prioritizes proactive efforts that will minimize damage to bridges due to seismic events and undermining of bridge supports from scour.

*Prioritization arrays for these areas can be found in the appendix behind the '**Structures Preservation**' tab.*

Seismic

The seismic retrofit program avoids catastrophic bridge failures by retrofitting bridges and structures identified by the seismic risk level. WSDOT prioritizes state bridges for seismic retrofit based on seismic risk zones within the following groups of needs; connection of the superstructures to columns, column strengthening on bridges with single columns and column strengthening on bridges with multiple columns.

At present, the superstructure retrofitting is complete and the Department has made good progress on single column strengthening.

Scour

This program identifies and repairs scour-damaged bridges. Scour is defined as the removal of material from a streambed by high water flows. Scour can cause a bridge foundation to become unstable if an excessive amount of material under the foundation is removed. Historically, in Washington State, 37 out of 63 documented past bridge failures were the result of scoured foundations following high water flows.

The Department programs all identified scour repair work each biennium because of past history and the relatively small cost, less than \$3 million per biennium.

Other Facilities Preservation

The preservation of other state highway facilities includes:

- Unstable Slopes
- Weigh Stations
- Rest Area Rehabilitation
- Major Drainage Rehabilitation
- Major Electrical Rehabilitation

Prioritization arrays for these areas can be found in the appendix behind the 'Other Facilities Preservation' tab.

Unstable Slopes

Slope failure can cause roadway closures and injuries. WSDOT uses a multi-step process to identify unstable rock and soil slopes. The Department's geotechnical engineers have lead responsibility to identify needs and prioritize projects based on the degree of risk and the benefits associated with eliminating potential road closures, injuries, rock fall patrol, and roadway cleanup.

To prioritize individual slopes within the statewide inventory the slopes are rated using a systematic approach based on consistent and measurable criteria. WSDOT has developed a numerical slope rating system using the following eleven criteria.

- Type (soil or rock)
- Average Daily Traffic
- Decision Sight Distance (minimum distance required for a driver to detect a hazard and take corrective action)
- Impact of Failure on Roadway (how many feet of roadway will be impacted)
- Roadway Impedance (Portion of roadway affected, i.e. shoulder, one lane, etc.)
- Average Vehicle Risk
- Pavement Damage
- Failure Frequency
- Annual Maintenance Costs
- Economic Factor (Length of detour)
- Accidents in the Last Ten Years

The above factors are applied to individual unstable slopes using a numeric value, thus producing three categories of slopes, high risk, moderate risk and low risk. This enables WSDOT to focus on high-risk unstable slopes within the state. Further selection is done based on the largest benefit for the transportation dollars expended. To the extent possible, unstable slopes on the high-risk list along Interstate facilities and principal arterials are mitigated first, followed by those on lower-volume roadways.

Weigh Stations

WSDOT complements the Washington State Patrol's (WSP) effort to prevent over-height and over-weight trucks from damaging the state's pavements and bridges by rehabilitating deteriorated weigh station facilities and constructing new locations as the needs are identified. WSDOT's preservation program builds the off and on-ramps, signage and illumination, while WSP's budget provides the buildings and utilities.

Rest Area Rehabilitation

Many of WSDOT's rest area facilities are approaching 30 years of life and need to be updated for compliance with current sewer and water standards. Some facilities have high maintenance costs due to age and high usage and need replacement. WSDOT capital facilities office inspects all rest areas on a biennial timeline, identifies sewer and water needs, building needs and site needs for programming. Emphasis is placed on sewer and water needs first with building second and site work last.

The Department prioritizes projects base on maintenance costs, public health upgrade requirements, and the number of visitors.

Major Drainage Rehabilitation

This program area identifies and replaces old, deteriorated drainage systems for culverts and catch basins. Deteriorated drainage systems typically collapse resulting in settlement of the roadway or failures during heavy rainfall events. Roadways can also fail when the drainage feature receives flows larger than what was designed for. This results in a washout due to impounded water.

Program management and highway maintenance staff work together to identify and prioritize these needs based on the remaining predicted life expectancy of the feature and the cost of the work.

Major Electrical Rehabilitation

WSDOT identifies old, deteriorated electrical systems such as traffic signals, highway luminaries, overhead-sign lighting systems, variable messages signs, highway cameras and traffic control systems, and mechanical features such as tunnel ventilation systems. Electrical and mechanical system failures can lead to traffic delays, accidents and unsafe conditions for the transportation users.

Program management and traffic operations staff work together to identify and prioritize these needs, some as old as 40 years, well beyond their expected 20 – 25 year life span.

The Highway Improvement Program

What does state law require for prioritizing improvement projects?

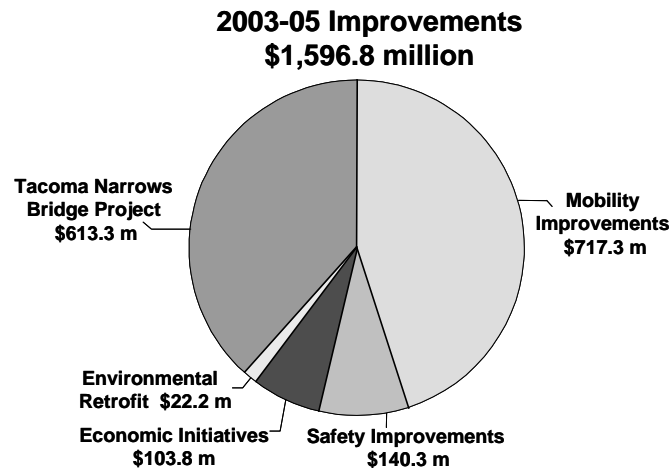
The Department must use a process to prioritize projects to improve the existing state highway system based primarily upon the following (RCW 47.05.051(2)):

- Traffic Congestion, delay and accidents
- Location within a heavily traveled transportation corridor
- Synchronization with other potential transportation projects, including transit and multi-modal projects, within the heavily traveled corridor
- Use of benefit/cost analysis wherever feasible to determine the value of the proposed project

Priority programming for the improvement program may also take into account:

- Support for the state's economy, including job creation and job preservation
- Cost-effective movement of people and goods
- Accident and accident risk reduction
- Protection of the state's natural environment
- Continuity and systematic development of the highway transportation network
- Consistency with local comprehensive plans developed under chapter 36.70A RCW
- Public views concerning proposed improvements
- The conservation of energy resources
- Feasibility of financing the full proposed improvement
- Commitments established in the previous legislative sessions
- Relative costs and benefits of candidate programs

The improvement program deals with all of the above issues by identifying needs through the Highway System Planning process and uses the following budget subprograms to prioritize and program projects.



*The Tacoma Narrows Bridge is a special project representing a significant portion of the current budget.

Mobility Improvements

The objective of this program area is to reduce traffic congestion and delays on state highways, improve existing travel options and to create links and remove barriers between transportation facilities and services.

The mobility improvement program includes these three categories:

- Urban / Rural Mobility
- Puget Sound Core HOV Lanes
- Urban Bicycle Connectivity

Prioritization arrays for each of these project types can be found in the appendix behind the 'Mobility Improvements' tab.

How does the Department identify congested locations?

Previous Methodology: Traditional measures of congestion that have been used nationally are referred to as Level of Service standards. These measures use a letter grade, from A to F, to denote how “full” a roadway is, based on peak hour volumes compared to hourly capacities. At about three quarters full, or what would be referred to as Level of Service D, roadways begin to experience slowing and delay. In the past, WSDOT used these Level of Service measures to identify congested location on the highway system.

WSDOT has used different standards for urban and rural areas. Level of Service (LOS) C as the standard for rural areas to be deficient, meaning that the target is no peak period congestion. For urban roadways, LOS D is used, meaning that some congestion is tolerated before classifying a roadway as deficient.

Shortcomings to LOS:

Though Level of Service measures can be calculated with readily available data, there are a number of limitations.

- A one-hour measure is inadequate to fully describe all-day congestion.
- The one-hour A to F measures are not sensitive enough to describe the benefits (especially outside the of the peak-hour) of proposed actions.
- LOS measures do not account for non-recurring congestion from accidents or other incidents.
- LOS measures are representative of a specific location, while commuters care more about their entire trip.

WSDOT Moves Forward:

WSDOT is moving toward new congestion measures that account for:

- Delay over a 24-hour period,
- Differentiate between recurring and non-recurring congestion
- Severity, extent, duration and variability of congestion will include, speed, travel time, and delay.

Many of these new measures require extensive data collection. Currently this data is only being collected on urban freeways in the Puget Sound region. As these new measures are developed, WSDOT will incorporate them into plans and programs to better describe and monitor congested conditions.

Urban / Rural Mobility

Projects in this category are designed to widen roadways, construct new or modify existing interchanges and add auxiliary or passing lanes. Due to the scale of many of these projects, other non-capacity improvements or preservation work may be included within the project's limits. Examples of this additional work in clued safety improvements, retrofit of existing environmental impacts and resurfacing of pavements.

Urban and rural mobility projects are prioritized separately. The primary element considered in prioritization formulas is the net benefit, which makes up 65% of the projects prioritization score. These benefits include the value of travel time saved and the savings in societal costs of accidents anticipated to be eliminated after completion of the project. The remaining 35% of the project's prioritization score comes from other factors such as community support and environmental impacts.

Puget Sound Core HOV Lanes

The Department has identified a specific set of congested highway segments in the Puget Sound area for the construction of a series of High Occupancy Vehicle lanes for the movement of buses and car pools. The Department prioritizes this series of projects in an order to ensure that each segment will operate properly.

Urban Bicycle Connectivity

The Department has a program to identify local bicycle facilities that are severed by a WSDOT highway facility and place the bicycling users at risk of a collision. WSDOT prioritizes these location with the assistance of the local bicycling communities by determining the locations with the most risk and usage. Cost is also a factor.

Safety Improvements

The objectives of this subprogram are to provide the safest possible highways with available resources and to improve pedestrian safety.

This program is segregated into two categories:

- Collision Reduction
- Collision Prevention

Prioritization arrays for each of these project types can be found in the appendix behind the 'Safety Improvements' tab.

How does the Department identify accident locations?

WSDOT's Transportation Data Office records all traffic accidents into the Collision Location and Analysis System. The information from state accident reports identifies where, what, how and the circumstances under which accidents occur. Based on this information, statistical analysis is performed to determine the location of High Accident Locations (HALs), High Accident Corridors (HACs) and Pedestrian Accident Locations (PALs). WSDOT engineers use this information to understand the cause behind accidents so that a cost effective solution can be developed to solve the problem.

Collision Reduction

Collision Reduction focuses on identifying location with existing accidents and developing projects to reduce the number and severity of accidents.

Collision Reduction uses the following strategies:

- High Accident Locations
- High Accident Corridors
- Pedestrian Accident Locations

High Accident Locations (*HALs*)

High Accident Locations are spot locations less than a mile long which have had a higher than average rate of accidents during the previous two years.

Emphasis for project selection is given to fatal and disabling accidents by assigning more points to these types of accidents. HAL projects reduce the number and severity of accidents and bring the roadway up to current design standards.

Projects are initially prioritized based on the number and severity of accidents anticipated to be eliminated compared to the cost of the project. Adjustments are then made to align projects within the program with other paving projects.

High Accident Corridors (*HACs*)

High Accident Corridors are one or more miles long and are above average in the number, severity, and cost of accidents. HAC projects reduce the number and severity of accidents and bring the roadway up to current design standards. These projects also provide a wider shoulder for bicycle users on designated bicycle routes.

Projects are initially prioritized based on the number and severity of accidents anticipated to be eliminated compared to the cost of the project. Adjustments are then made to align safety projects within the program with other paving projects.

Pedestrian Accident Locations (*PALs*)

Pedestrian Accident Locations are areas where at least four pedestrian–vehicle collisions have occurred during the last six years. PAL projects reduce the number and severity of these accidents by installing pedestrian features such as modification of sidewalks to reduce crossing distances at intersections, better lighting, advance warning signs, refuge islands in the center of the roadway, other sidewalk improvements and in-pavement warning systems. These projects are prioritized based on the number and severity of accidents anticipated to be eliminated compared to the cost of the project.

Collision Prevention

Collision Prevention focuses on preventing accidents before they occur and includes the following strategies:

- Interstate Safety
- Risk Reduction
- At Grade Intersection
- Signal and Channelization
- Pedestrian Risk
- Special Safety Initiative

Interstate Safety

WSDOT and the Federal Highways agreed to create a strategy to identify non-standard features on the Interstate System and initiate a program to bring them up to standards.

These projects typically extend on and off-ramps to the interstate, remove fixed objects, and flatten slopes on the side of the freeway.

These projects are not prioritized but are imbedded in roadway preservation projects otherwise being carried out. The amount of work programmed within a biennium is limited to funds available for this purpose (for the 2003-05 budget - \$16 million).

Risk Reduction

Locations are identified where few accidents have occurred but the potential for accidents is above average due to traffic volumes and non-standard features on the roadway and roadside. These projects improve safety by removing fixed objects, flattening roadside slopes, improving horizontal and vertical stopping sight distance, and roadway widening.

These projects are prioritized based on the number of potential accidents eliminated and the cost of the proposed project.

At Grade Intersections

Intersections are identified that meet the following criteria:

- On the National Highway System
- Multi lane
- Median separated
- Speeds in excess of 45 mph

These intersections have the potential for serious accidents as the volume of mainline and crossroad traffic increases. WSDOT intends to eliminate these intersections and construct grade-separated roadways to prevent accidents. These projects will also restore the environment by treating stormwater drainage.

The Department prioritizes these projects based on the number and severity of accidents anticipated to be eliminated as a result of the improvements compared to the cost of the proposed project.

Signal and Channelization

Intersections are identified where traffic volumes are growing and/or minor accidents are beginning to occur. These projects improve

safety by adding channelization to eliminate rear-end collisions with left or right turning vehicles and by adding signals as the traffic volumes grow.

These locations are prioritized based on traffic volumes, accidents and the cost of the proposed project.

Pedestrian Risk

Locations are identified where pedestrians are at higher risk such as around schools, senior centers, and transit facilities. These locations are identified by WSDOT's coordination with local pedestrian groups.

These projects reduce pedestrian risk by installing features such as modification of sidewalks to reduce crossing distances at intersections, better lighting, advance warning signs, refuge islands in the center of the roadway, some sidewalk improvements, and n-pavement warning systems.

Projects are prioritized by the potential use and cost of the proposed project.

Special Safety Initiatives

Special Safety Initiatives focuses on specific low-cost features that can be implemented statewide to reduce accidents and their severity. These initiatives include:

- Installation of shoulder rumble strips on rural multi-lane highways to alert sleepy drivers.
- Replacement of non-standard guardrail installed prior to 1970.
- Installation of three-beam guardrail to strengthen non-standard bridge rails built before 1968.
- Installation of median cross-over protection to prevent vehicles from driving through the median.

These projects are prioritized based on the number of accidents eliminated and the cost of the proposed project or by the number and severity of accidents anticipated to be eliminated compared to the cost of the proposed project. The methodology used varies depending on the type of project.

Economic Initiatives

The objectives of this improvement program are to reduce delay to freight movement on state highways, to partner with public and private entities to improve the highway system in support of trade and economic development, and to provide integrated traveler services and tourism support. Economic Initiatives include five categories:

- All Weather Highways
- Four-Lane Trunk System
- Restricted Bridges
- New Rest Areas
- Rural Bicycle Touring Routes

All-Weather Highways

This category of projects consists of projects that prevent damage by heavy loads when the roadway thaws after a freeze.

To identify the sections of highway that are susceptible to this type of damage the roadway surface depth is compared to the anticipated frost depth and if the roadway surface depth is less than 50% of the frost depth then the roadway section is deficient. Generally, the Department does not close these roadways to prevent damage, but leaves them open to ensure freight movement into and out of a community. As a result of this practice, WSDOT experiences most of the loss in value, which includes increased roadway maintenance and decreased pavement life. Roadway depth needs to be increased in order to resist the impacts from trucks.

The priorities in this category are determined by the cost effectiveness of fixing the pavement structure permanently compared to the on-going maintenance costs.

Four-Lane Trunk System

To promote economic development, multi-lane freight corridors between communities with populations of 50,000 or greater are provided.

Three corridors were identified in the Highway System Plan. Of those three routes, Congress provided federal funding for the completion of SR 395 between Pasco and Ritzville. State funds have allowed significant progress towards completion of SR 18 between Auburn and North Bend. State funding was provided in the Transportation 2003 Funding Package for the third corridor between Pasco and Wallula Junction near Oregon.

WSDOT does not presently have a standard practice for prioritization of projects in this category. Congress and the State Legislature have previously funded these projects as a matter of policy discretion.

Restricted Bridges

The Restricted Bridges category includes projects to replace or modify bridges that are structurally sound but which have an operational limitation of either low vertical clearance (under 15'-6") on the interstate or insufficient strength to carry a legal overload of 105,000 pounds.

The projects in this category are prioritized by calculating the cost effectiveness of eliminating the travel delay time for freight haulers and/or the military.

New Rest Areas

The Department strives to provide a safety rest stop every 60 miles throughout the state highway system. The Legislature requires that the department develop a partnership with another organization in order to build a new rest area.

The priorities in this category are determined by the cost effectiveness of serving the anticipated number of users, including the construction, operation, and maintenance costs of the facility.

Rural Bicycle Touring Routes

Three east-west, and three north-south corridors have been designated as rural bicycle touring routes and developed a modified design standard to provide a minimum four foot wide shoulder to accommodate bicycle travel.

The Department determines the bicycle touring needs by first identifying where four-foot shoulders already exist and where the Safety Program will include four-foot shoulders as a solution to fix Collision Reduction or Prevention needs. Areas unaddressed by the above are then prioritized.

Environmental Retrofit

The Department of Transportation corrects many environmental deficiencies in other project categories that address congestion relief, safety, economic development and bridge replacement. However, the environmental Retrofit Program is focused on correcting existing conditions on state highways where the roadway does not conform to current environmental requirements and no other highway system plan work has been identified. The following categories were established:

- Fish Barrier Removal
- Noise Reduction
- Stormwater Runoff

Fish Barrier Removal

WSDOT entered into a memorandum of understanding with the Department of Fish and Wildlife (WDFW) to inventory culverts on the state highway system that do not allow fish to pass. WDFW also completes a habitat survey and preliminary scope of work to determine the amount of spawning area that will be reopened after the blockage is eliminated along with a preliminary construction cost estimate. This information is then used to determine a priority index to determine which culverts will provide the greatest increase in the number of fish to spawn.

WDFW also checks all downstream culverts to identify other blockages and works with the owners to fix them (not at WSDOT's expense) so fish can reach the new habitat area to spawn. WDFW periodically samples restored streams to estimate the number of

returning fish to demonstrate that the investment in barrier removal provided a benefit.

Noise Barriers

Since 1977 the Federal Highway Administration has required that noise levels above 68 decibels be mitigated. During the 1980's the Department surveyed highways built prior to 1977 to identify location where noise levels exceeded the acceptable level. These locations are periodically re surveyed; the latest survey was completed in 2002.

The Department prioritizes these locations based on a formula that divides the cost of the noise wall into benefit provided to the number of residents helped by the wall.

Stormwater Retrofit

The Department is currently inventorying its existing facilities to locate impervious surfaces, to identify the location of stormwater runoff drainage points or outfalls, and determine whether they have been retrofitted in accordance with WAC 173-270-060. During the inventory process the engineers and environmentalists collect information about the quantity and quality of the stormwater runoff and the quality of the stream or river affected. This information, along with cost data, will be used by the Department to prioritize locations.

How can the Prioritization Process be Improved?

In the early 1990's WSDOT significantly modified the processes used for prioritization of highway improvement and preservation projects. Over the last ten years these processes have continued to evolve as additional research was incorporated and additional processes were developed for newly identified needs.

In many program areas these processes have shown to be very successful. However opportunities for further improvement to prioritization methods exist in the program areas described below. In addition, WSDOT has struggled with methods to communicate the results of existing prioritization processes and the resulting highway user benefits of each project.

Bridge Preservation Projects: WSDOT needs to develop methods to better quantify the benefits of bridge preservation work. Additionally, the Department needs to identify ten years of bridge preservation needs so they can be incorporated into the scope of mobility projects or combined into fewer preservation projects to minimize the cost of multiple contracts and the associated traffic disruptions to the motoring public.

Unstable Slopes: Implement a revised prioritization process that ranks projects by benefits and cost within ranges of similar deficiency risk to emphasize higher risk needs first.

Major Drainage and Electrical/Mechanical Rehabilitation: WSDOT needs to develop a comprehensive inventory of culverts and electrical features and their condition in order to identify the most pressing needs for prioritization and programming. This will minimize the occurrence of unprogrammed emergent projects during the course of the biennial program.

Mobility: WSDOT needs to do additional work on how to integrate the disparate instructions for ESHB 2304 into an existing system that yields objective weightings to the fundamentals in the law.

1. *Traffic congestion, delay and accidents;*
2. *Location with a heavily traveled transportation corridor;*
3. *Synchronization with other potential transportation projects, including transit and multimodal projects, within the heavily traveled corridor;*
4. *Use of benefit/cost analysis wherever feasible to determine the value of the proposed project.*

Safety Reduction: WSDOT has been active in identifying highway segments with a potential for accidents so improvements can be completed before accidents occur. This approach involves analyzing accident data and the accompanying roadway and roadside characteristics in order to develop predictive models. The Department has recently developed new models based on Washington accident information instead of the national data that has been previously used.

All Weather Roadways: Incorporate this category into the *Pavement Preservation* category and use cost-effective methods to develop the appropriate pavement solution to address these needs.

New Rest Areas: Incorporate this work into the *Safety Program* as a strategy to provide a place for tired motorists to rest and therefore reduce accidents.

Rural Bicycle Touring Routes: Incorporate this work into the *Collision Prevention* category of the *Safety Program* as four-foot shoulders provide a safety advantage for both bicyclists and motorists alike.

Stormwater Retrofit: Identify cost effective methods to retrofit the highway system to treat stormwater runoff and the benefits of this work.

Noise Barrier Retrofit: Review and clarify the stated benefits of this work.

Chronic Environmental Retrofit: WSDOT needs to compete the development of this new environmental category so the Department can take advantage of a provision within section 4(d) of the Endangered Species Act. Instead of having to mitigate environmental impacts created by repeated emergency work to protect the state highway, the Department can apply the mitigation funds toward a permanent solution if the Department has a program in place to identify and prevent the reoccurrence.

Current tribal litigations may impact the use of resources in the prioritization of future environmental retrofit projects.